In the Claims:

1. A method for real-time encoding of an audio signal comprising:

grouping spectral lines to form scale band factors by determining masking thresholds based on human perception system;

shaping quantization noise in spectral lines in each scale band factor by using their associated local gains; and

running a loop for each scale band factor to satisfy a predetermined bit allocation rate based on a bit allocation scheme.

2. The method of claim 1, wherein shaping the quantization noise in the spectral lines in each scale band factor comprises:

shaping quantization noise in the spectral lines by assigning quantization precision based on band energy ratios and SMRs.

3. The method of claim 2, wherein shaping the quantization noise in the spectral lines by assigning precision based on band energy ratios and SMRs comprises:

shaping the quantization noise in each scale band factor such that a difference between SMR and SNR in each scale band factor is substantially constant.

4. The method of claim 3, wherein shaping the quantization noise in each scale band factor such that the difference between SMR and SNR is substantially constant comprises:

assigning a higher quantization precision to scale band factors having a high SMR; and

assigning a quantization precision to each scale band factor that is inversely in proportion to their energy content with respect to frame energy to desensitize the scale factor bands.

5. A single-loop quantization method for band-by-band coding of an audio signal comprising shaping quantization noise in each band using its local gain.

6. The method of claim 5, wherein shaping the quantization noise in each band using its local gain comprises:

shaping the quantization noise in each band by setting a scale factor in each band based on its psychoacoustic parameters and energy ratio.

7. The method of claim 5, wherein shaping quantization noise in each band using its local gain comprises:

shaping quantization noise in the spectral lines in each band such that a difference between Signal-to-Mask Ratio (SMR) and Signal-to-Noise Ratio (SNR) in each band is substantially constant.

8. The method of claim 7, wherein the spectral lines are derived by performing a time to frequency transformation of the audio signal.

9. The method of claim 7, further comprising:

partitioning the audio signal into a sequence of successive frames;

forming bands including groups of neighboring spectral lines for each frame based on critical bands of hearing; and

computing local gain for each band.

10. The method of claim 7, wherein shaping quantization noise in each band such that the difference between SMR and SNR is substantially constant comprises:

assigning a higher quantization precision to bands having a higher SMR; and

further assigning quantization precision to each band such that the assigned quantization precision is inversely in proportion to their energy content with respect to band energy to desensitize the bands.

11. The method of claim 5, wherein the local gain in each band is derived using the equation:

$$K_b = -(int)(a * log2(en(b)/sum\_en) + \beta * log2\ (SMR(b)))$$

wherein K_b is the local gain for each band, *log2* is logarithm to *base 2, en(b)* is the band energy in band *b*, *sum_en* is total energy in a frame, *SMR (b)* is the psychoacoustic threshold for band *b*, wherein *a* measures weightage due to energy ratio, and β is a weightage due to SMRs.

12. A method for encoding an audio signal, based on a perceptual model, comprising quantization noise shaping of spectral lines on a band-by-band basis using their local gains such that difference between SMR and SNR is held substantially constant for each band.

13. The method of claim 12, wherein the local gains are derived from energy ratios and SMRs in each band.

14. The method of claim 13, wherein the energy ratios are computed by dividing energy in each band over sum of energies in all bands.

15. The method of claim 12, wherein the quantization noise shaping of each scale band factor such that the difference between SMR and SNR is substantially constant comprises:

assigning a higher quantization precision to bands having a high SMR; and

assigning a quantization precision to each band that is inversely in proportion to their energy content with respect to band energy to desensitizing the bands.

16. The method of claim 15, wherein fitting the noise shaped spectral lines comprises:

estimating a bit demand for each band; and

allocating the estimated bit demand based on a predetermined bit rate.

17. An apparatus comprising an encoder to quantize an audio signal based on a perceptual model comprising quantization noise shaping of spectral lines on a band-by-band basis using their local gains and fitting spectral lines within each band based on a given bit rate.

18. The apparatus of claim 17, wherein quantization noise shaping the spectral lines on the band-by-band basis comprises:

quantization noise shaping the spectral lines on the band-by-band basis such that the difference between SMR and SNR is substantially constant in each band.

19. The apparatus of claim 18, wherein the local gains are derived from energy ratios and SMRs in each band.

20. The apparatus of claim 18, wherein the local gains are derived using the equation:

$$K_b = -(int)(a * log2(en(b)/sum\_en) + \beta * log2\ (SMR(b)))$$

Wherein K_b is the local gain for each scale band factor, *log2* is logarithm to base 2, *en(b)* is the band energy in scale band factor *b*, *sum_en* is the total energy in a frame, *SMR (b)* is the psychoacoustic threshold for scale band factor *b*, wherein *a* measure weightage due to energy ratio, and β is the weightage due to SMRs.

21. An apparatus for coding a signal based on a perceptual model, comprising:

means for shaping quantization noise in spectral lines on a band-by-band basis by using their local gains; and

means for quantizing the shaped spectral lines in each band based on a predetermined bit rate.

22. The apparatus of claim 21, further comprising:

means for partitioning the signal into a sequence of successive frames;

means for performing time-to-frequency transformation to obtain the spectral lines in each frame; and

means for forming bands by grouping neighboring spectral lines within each frame.

23. The apparatus of claim 21, wherein the means for quantizing of the spectral lines further comprises:

means for estimating bit demand in each band; and

means for allocating bits based on a predetermined bit rate.

24. The apparatus of claim 21, wherein the means for shaping the quantization noise in the spectral lines on a band-by-band basis by using their local gains comprises:

means for shaping quantization noise in the spectral lines such that the difference between SMR and SNR is substantially constant for each band.

25. An audio encoder comprising a quantizer to shape quantization noise in spectral lines in each band by using its local gain and to further run a loop to fit the shaped spectral lines in each band within a predetermined bit rate.

26. The audio encoder of claim 25, further comprising:

an input module to partition an audio signal into a sequence of successive frames; and

a time-to-frequency transformation module to obtain the spectral lines in each frame, wherein the time-to-frequency transformation module to form bands by grouping neighboring spectral lines with each frame.

27. The audio encoder of claim 25, wherein the quantizer comprises:

a noise shaping module to shape the quantization noise in each band such that a difference between SMR and SNR is held substantially constant in each band; and

an inner loop module to fit shaped band within the predetermined bit rate.

28. An article comprising:

a storage medium having instructions that, when executed by a computing platform, result in execution of a method comprising:

encoding an audio signal, based on a perceptual model, by noise shaping spectral lines on a band-by-band basis using their local gains such that difference between SMR and SNR is held substantially constant for each band.

29. The article of claim 28, wherein the local gains are derived from energy ratios and SMRs in each band.

30. The article of claim 29, wherein the energy ratios are computed by dividing energy in each band over sum of energies in all bands.

31. A system comprising:

a bus;

a processor coupled to the bus;

a memory coupled to the processor;

a network interface coupled to the processor and the memory; and

an audio encoder comprising a quantizer coupled to the network interface and the processor to shape quantization noise in spectral lines in each band by using its local gain and to further run a loop to fit the shaped spectral lines in each band within a predetermined bit rate.

32. The system of claim 31, further comprising:

an input module to partition an audio signal into a sequence of successive frames; and

a time-to-frequency transformation module to obtain the spectral lines in each frame, wherein the time-to-frequency transformation module to form bands by grouping neighboring spectral lines with each frame.

33. The system of claim 32, wherein the quantizer comprises:

a noise shaping module to shape the quantization noise in each band such that a difference between SMR and SNR is held substantially constant in each band; and

an inner loop module to fit shaped band within the predetermined bit rate.